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ABSTRACT

Part of the Anthropology Curriculum Project, the document contains a programmed text on evolution and a vocabulary pronunciation guide. The unit is intended for use by students in social studies and science courses in the 5th, 6th, and 7th grades. The bulk of the document, the programmed text, is organized in a question answer format. Students are directed to fill in blanks, complete sentences, compile lists and then to turn the page and check their answers against the correct responses. Background information is interwoven throughout the text on a variety of evolution-related topics including various explanations of evolution, genes, inheritance, mutation, genetic drift, heredity, species, adaptation, natural selection, and comparative anatomy. The pronunciation guide which accompanies the programmed text lists and divides into syllables 21 evolution-related vocabulary words. Also available to accompany the text and pronunciation guide is a tape recording of the 21 vocabulary words which is intended to enable students to hear and practice saying the words. (DB)

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EVOLUTION

A Programmed Text

by

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INTRODUCTION

We hope you will like this book! It is called a PROGRAMMED textbook.

This book is different from most books you have read. Not only will it tell you things, it will ask you questions about what it tells you. By reading the book carefully and answering all the questions it asks, you will learn quickly and well.

Be sure you answer the questions on the page you are reading, but DO NOT look on any page except the one you are on. DO NOT turn back to a page to find an answer. DO NOT turn to the next page to find an answer.

Sometimes if you miss a question, you will have to write the correct answer before you go on. Just be sure you take your time and follow directions.

Sometimes you will be told to skip a page. Be sure you do exactly as the book says.

Here are two things to do:

1. TAKE YOUR TIME
2. FOLLOW DIRECTIONS

Your Name _____

Your School _____

Your Teacher's Name _____

This page is for you to keep a record of how far you have read in the book.

Your teacher will tell you how to keep your record. Please write CLEARLY.

1. Today's date is _____.
I started reading at _____ o'clock.
I stopped reading at _____ o'clock.
I read to page _____.
2. Today's date is _____.
I started reading at _____.
I stopped reading at _____.
I read to page _____.
3. Today's date is _____.
I started reading at _____.
I stopped reading at _____.
I read to page _____.
4. Today's date is _____.
I started reading at _____.
I stopped reading at _____.
I read to page _____.
5. Today's date is _____.
I started reading at _____.
I stopped reading at _____.
I read to page _____.

6. Today's date is _____.

I started reading at _____.

I stopped reading at _____.

I read to page _____.

7. Today's date is _____.

I started reading at _____.

I stopped reading at _____.

I read to page _____.

I finished the book on _____.

(DATE)

Which of these is a HORSE?

WAIT A MINUTE! Before you answer, look at each animal very carefully.

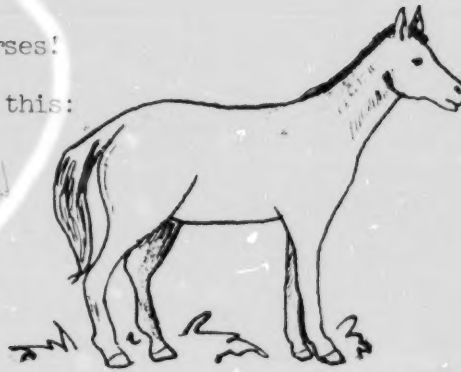
Now put a ✓ under the one you think is a HORSE.



Turn the page to find the answer.

Answer: ALL of them are horses!

Horses today look like this:



All of the other pictures are horses, too. 58 million years ago, the animals we call horses looked like this:



They were not much bigger than a cat.

Very slowly, as time passed, the animals changed. 25 million years ago, this is what they looked like:



More time passed, and the animals looked like this:



Today, as you know, horses look like this:



ALL living things, both plants and animals, change slowly over the years. The elephants that are living today do not look like the elephants that lived many, many years ago. PEOPLE today do not look like the people who lived 100,000 or more years ago.

EVOLUTION is the word that means the slow change in living things over the years.

Write down the names of ANY three different plants you can think of:

1. _____
2. _____
3. _____

Now write down the names of ANY three different animals you can think of:

1. _____
2. _____
3. _____

No matter what plants or animals you wrote down, they have all changed over the years. The change that has taken place is called E V O L _____

(fill in blanks)

When you fill in the blanks, turn the page.

Answer:

E V O L U T I O N .

Check your answer carefully. Did you write every letter correctly?

_____ Yes

_____ No

EVOLUTION is an important word to know and use. It is the scientific word for THE SLOW CHANGE THAT OCCURS IN ALL LIVING THINGS. Write this important word once again on the next line:

_____.

EVOLUTION occurs in man as well as other animals.

ANTHROPOLOGISTS, scientists who study man and his culture, are interested in man's EVOLUTION.

You already know that ANTHROPOLOGISTS study MAN and his CULTURE.

There are 2 divisions of anthropology:

CULTURAL anthropology

and

PHYSICAL anthropology

CULTURAL anthropologists study man and his CULTURE or his way of life.

PHYSICAL anthropologists study man as a member of the animal kingdom. They study his PHYSICAL or bodily appearance: his eyes, his hair, his bones, his muscles. PHYSICAL anthropologists are very interested in the evolution of man. They want to learn how man has changed physically over the years.

Use these words to fill in the blanks. When you use a word, draw a line through it so you won't use it again.

EVOLUTION

PHYSICAL

CULTURAL

1. Some anthropologists study man's CULTURE or ways of living. These anthropologists are called _____ anthropologists.
2. A pine tree living today may not look like a pine tree that lived 10,000 years ago. The changes that have taken place are due to _____.
3. Some anthropologists study man as a member of the animal kingdom. They are called _____ anthropologists.

When you finish, turn the page to check your answers.

Answers:

1. CULTURAL
2. EVOLUTION
3. PHYSICAL

Put X by the ones you missed on page 6.

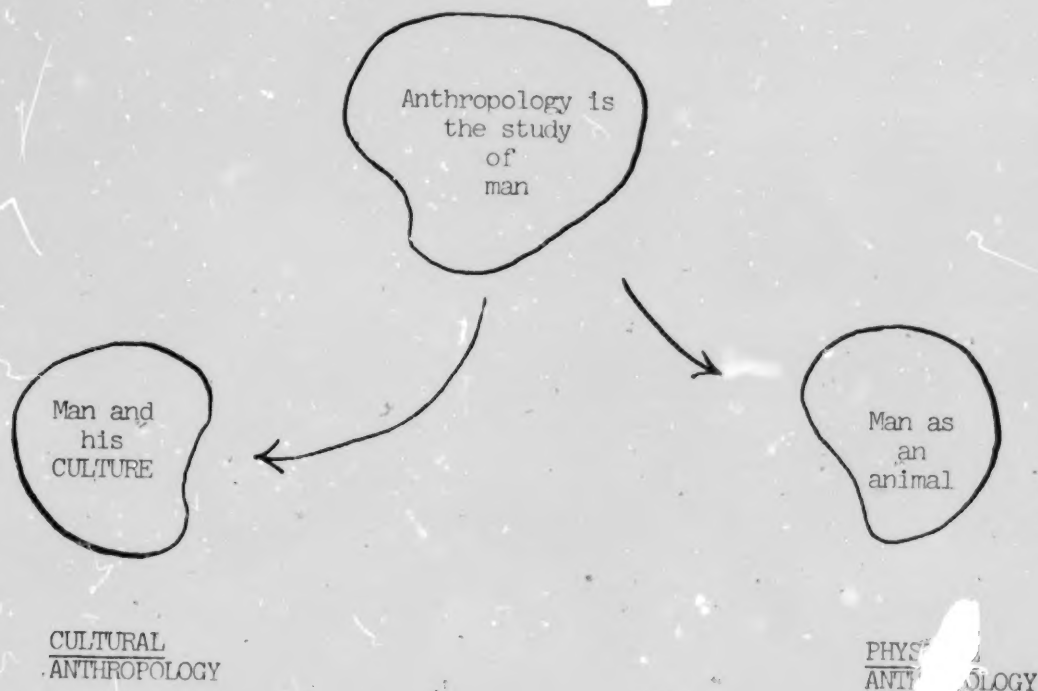
Did you miss any?

_____ Yes (turn to page 8)

_____ No (SKIP page 8 and turn to page 9)

Sorry you missed some, but I will help you get back on the track.

ANTHROPOLOGY is the study of MAN. There are 2 main divisions of ANTHROPOLOGY.



One more thing: EVOLUTION is the process of slow change that happens to all kinds of plants and animals. It takes millions of years to happen, but it does happen. Remember the example I gave you about the HORSE? Our horses today do not look like the horses of 50 million years ago. Because of EVOLUTION, living things change.

PHYSICAL anthropologists are interested in the EVOLUTION of man. That is, they want to find out about man's beginnings and how he has slowly changed in physical or bodily appearance.

The first scientific explanation of EVOLUTION was made by an Englishman, CHARLES DARWIN.

About 140 years ago, an English ship named THE BEAGLE sailed from England to study the coasts of SOUTH AMERICA and some of the PACIFIC ISLANDS. CHARLES DARWIN was on the ship, THE BEAGLE. His job was to collect plants and animals and to keep records of what he saw in nature on the trip.

Let's see how carefully you read the last page. Try to answer the questions below. Put a ✓ by the answers you choose. Do the best you can, and NO PEEKING!

1. Who first explained evolution?

_____ A. David Carson

_____ B. Charles Darwin

2. What country sent a ship to study the coasts of other lands?

_____ A. America

_____ B. England

3. What was the name of this ship?

_____ A. The Beagle

_____ B. The Naturalist

4. Where did the ship go?

_____ A. South America and some Pacific Islands

_____ B. North America and Alaska

When you finish, please turn the page.

Answers:

- B 1.
- B 2.
- A 3.
- A 4.

Put X by any questions you missed on page 10.

Did you miss any?

 Yes (turn to page 12)

 No (skip page 12 and turn to page 13)

You missed some of the questions. Well, probably you did not take enough time reading about CHARLES DARWIN and the trip he took on the BEAGLE.

No one is rushing you, so please take your time. I'll tell you about CHARLES DARWIN again.

The first scientific explanation of EVOLUTION was made by an Englishman, CHARLES DARWIN.

About 140 years ago, an English ship named THE BEAGLE sailed from England to study the coasts of SOUTH AMERICA and some of the PACIFIC ISLANDS. CHARLES DARWIN was on the ship, THE BEAGLE. His job was to collect plants and animals and to keep records of what he saw in nature on the trip.

Use the paragraphs above to help you fill in the blanks:

1. What was the name of the ship? _____
2. Who was on the ship to study nature? _____
3. About how long ago did the ship sail? _____
4. Besides some Pacific Islands, where did the ship go? _____

When you fill in all the blanks, turn to page 13.

On the voyage of THE BEAGLE, Charles Darwin found some very interesting things that helped him explain EVOLUTION.

The trip lasted five years so Charles Darwin saw and did a lot of things. I want to tell you about one part of his trip. I think you will like to read about what Charles Darwin discovered on a group of little islands called the GALAPAGOS ISLANDS.

The GALAPAGOS ISLANDS are 13 islands in the Pacific Ocean off the coast of South America. On these 13 islands, Charles Darwin found finches, a type of bird. What was very strange to him was that the birds were ALIKE and NOT ALIKE.

Turn to page 14.

Do you think it is silly to say that something is ALIKE and yet NOT ALIKE? Well, let me tell you what I mean.

The finches were all basically alike. That is, it was easy to see that they were all finches and not parrots or eagles. Even though they were all finches, they were different, too. One way they differed was in their beaks.



A



B

Some of the finches had beaks that were thin and pointed.
Some of the finches had beaks that were heavy and strong.

Look at the pictures and answer these questions:

1. Which finch has a thick and heavy beak?

_____ A.

_____ B.

2. Which finch has a narrow, pointed beak?

_____ A.

_____ B.

Turn the page to check your answers.

Answers:

1. B
2. A

Put X by any that you missed. Check your answers carefully.

CHARLES DARWIN wondered why the finches on different islands of the GALAPAGOS ISLANDS had different kinds of beaks. He found that on islands where there were plenty of insects and worms, the finches' beaks looked like this:



The beaks were pointed and thin. This is the kind of beak that is good to get insects out of the bark of trees and out of tiny holes in the ground. Birds that eat insects have thin, pointed beaks.

On some of the GALAPAGOS ISLANDS where seeds and berries were plentiful, the finches' beaks looked like this:



A heavy, fat beak like this is good for cracking seeds and berries. The finches that had beaks like this ate seeds and berries.

CHARLES DARWIN thought and thought about these differences in finches on the different islands of the GALAPAGOS. He wondered, "Could these birds have been exactly alike millions of years ago? Could where they live now have something to do with how their beaks are shaped?"

Let's see if I have made this clear. Use the pictures to answer the questions.



A



B

1. Which bird can crack hard seeds easily?

_____ A

_____ B

2. Which bird is probably an insect eater?

_____ A

_____ B

When you finish, turn the page.

Answers:

1. B

2. A

Put X by those you missed.

Did you miss any?

_____ Yes (turn to page 19)

_____ No (Skip page 19 and turn to page 20)

Sorry your answers were wrong. Let me explain a little more.

A thin, pointed bird beak like this:



is good for getting insects out of tree bark and out of other places insects live.

A bird beak like this:



is strong and thick. It is heavy enough to crack open hard seeds and berries.

In the GALAPAGOS ISLANDS, finches with thin pointed beaks were found on some islands; and finches with heavy, strong beaks were found on other islands.

The finches on the GALAPAGOS ISLANDS helped CHARLES DARWIN think about EVOLUTION. He wondered if they had once upon a time had beaks exactly alike. He wondered if their beaks were different now because on different islands there were different kinds of food for the birds to eat.

The BEAGLE'S trip lasted 5 years. Over and over on that trip, CHARLES DARWIN saw all sorts of plants and animals that made him believe that EVOLUTION, the slow change in living things over a long time, was a fact.

When the Beagle returned to England, CHARLES DARWIN began to write down his ideas about EVOLUTION.

Other people had ideas that helped him in his work. I will tell you about some of the other scientific ideas that helped CHARLES DARWIN with his work on EVOLUTION.

All animals have scientific names. For example, here are the everyday names and the scientific names of some animals you know:

<u>Everyday name</u>	<u>Scientific name</u>
Lion	<u>Felis leo</u>
Tiger	<u>Felis tigris</u>
Zebra	<u>Equus burchelli</u>
Horse	<u>Equus caballus</u>
Man	<u>Homo sapiens</u>

Do not try to remember the scientific names. All you do need to remember is how many words are in each scientific name. Look at the names and put X by the answer you choose.

How many words are there in each scientific name?

- ☐ One (turn to page 22)
☐ Two (turn to page 23)
☐ Three (turn to page 24)

Your answer was:

✓ One

WRONG

The scientific name of the lion is Felis leo. Felis is one word, and leo is another word. Turn back to page 21 and choose another answer.

RIGHT

There are two words in the scientific name of every animal.

The method of classifying and naming animals is called the BINOMIAL SYSTEM. BINOMIAL actually means "two names."

O.K., here is what I want you to know:

The BINOMIAL SYSTEM is the scientific way to classify and name animals. In the BINOMIAL SYSTEM, each animal has 2 names.

Skip page 24 and turn to page 25.

Your answer was:

✓ Three

WRONG

The question was how many words are in each scientific name. The scientific name for lion is Felis leo. Felis is one word and leo is one word.

Turn back to page 21 and answer the question again.

The BINOMIAL SYSTEM gives each animal 2 names. It gives each animal

- (1) a GENUS name
- (2) a SPECIES name

Here is an example of a GENUS:



This is a lion and a tiger. They are closely related.

They are somewhat alike. They are in the same GENUS.

Here is another example of GENUS:



This is a zebra and a horse. They are closely related
so they are in the same GENUS.

LIONS and TIGERS are related; they are in the same GENUS.

They are related because they are both types of CATS. They have claws, they can climb, they purr when they are content. You can probably think of other ways they are alike. Even though they are alike, we can tell them apart so they have some differences, too.

HORSES and ZEBRAS are related. They both have hoofs, and they both eat grass and other plants. Can you think of other ways they are alike? Even though they are alike, can you tell a horse from a zebra? One of the biggest differences is that zebras have



Animals that are related to each other but which are not identical are often in the same GENUS.

Fill in the blank:

Horses and zebras are related; they are in the same

G _____

Answer:

G E N U S

If you did not spell it right, copy it correctly on the line at the bottom of page 26.

Here are two lions:



They are alike. They can mate and have baby lions. They are in the same SPECIES.

Here are some elephants. They are also alike. They do not differ in any important way; we can tell by looking that they are all elephants. They are in the same SPECIES.



Here is what I want you to understand about the two words. GENUS and SPECIES.

GENUS is a group of animals that show certain likenesses to each other but which can be divided into different groups:



SPECIES is a group of animals which are all of the same kind, and which can mate to reproduce other animals like themselves.



Fill in the blank:

Animals that are all of the same kind are in the same

S _____

Answer:

S P E C I E S

If you did not spell it right, copy it correctly on the line at the bottom of page 27.

In the BINOMIAL SYSTEM, every animal has a scientific name. The name has 2 parts:

(1) a GENUS name

(2) a SPECIES name

Maybe this will help you remember:

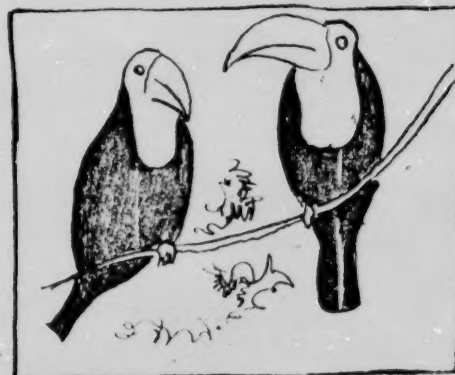
GENUS - generally related

SPECIES - specifically related



GENUS

They are generally related



SPECIES

They are specifically related

Fill in the blanks:

The binomial system gives such animals a (1) _____ name and a (2) _____ name.

If the animals are SPECIFICALLY alike, we can say they are in the same (3) _____. If they are only GENERALLY alike, they are in the same (4) _____.

Answers:

- (1) genus
- (2) species
- (3) species
- (4) genus

PUT X BY THOSE YOU MISSED.

Here is a MATCHING TEST. You can see how well you have learned. Put the correct numbers in the blanks. You will not need to use all the numbers, but be sure you fill all the blanks.

Take your time and be honest with yourself:

- | | |
|---|----------------------------|
| _____ A. the very slow change in living things over millions of years | 1. physical anthropologist |
| _____ B. an anthropologist who studies man as an animal | 2. archeology |
| _____ C. an anthropologist who studies man and his culture | 3. Donald Cramer |
| _____ D. the person who first explained evolution | 4. cultural anthropologist |
| _____ E. the Pacific Islands where finches were studied | 5. Genus |
| _____ F. a group of animals that are specifically alike, like 4 mice | 6. evolution |
| _____ G. a group of animals that are related but which can be divided into smaller groups | 7. binomial |
| | 8. Galapagos |
| | 9. Charles Darwin |
| | 10. Beagle |
| | 11. Species |
| | 12. finch |

When you finish, turn the page.

Answers:

6 A.

1 B.

4 C.

9 D.

8 E.

11 F.

5 G.

Check your answers and put X by those you missed.

(1) Did you miss A?

 No (read question 2 below)
 Yes (turn to page 31 and read under the letter A)

(2) Did you miss either or both B and C?

 No (read question 3 below)
 Yes (turn to page 31 and read under the letters B and C)

(3) Did you miss either or both D and E?

 No (read question 4 below)
 Yes (turn to page 32 and read under the letters D and E)

(4) Did you miss either or both F and G?

 No (turn to page 33)
 Yes (turn to page 32 and read under the letters F and G)

A

This entire book is about EVOLUTION. In it, you will learn how living things change over millions of years. Cows today are not like cows many years ago. People today are not like people of very long ago. The whole process of slow change in animals and plants is called EVOLUTION.

Please turn back to (2) on page 30.

B and C

Oops! Sorry you goofed! Let me explain again.

Anthropology is the study of man. Some anthropologists have special interests. The two main divisions of anthropology are:

PHYSICAL ANTHROPOLOGY: the study of man as a member of the animal kingdom.

CULTURAL ANTHROPOLOGY: the study of man's culture or his ways of life.

Please turn back to (3) on page 30.

D and E

You have forgotten some of the things you read! Take your time and read about Charles Darwin's trip again. Here goes:

CHARLES DARWIN was on the ship, BEAGLE, that went to study the coasts of South America and some of the Pacific Islands. On the 5-year trip, CHARLES DARWIN studied the animals and plants he saw. On the GALAPAGOS ISLANDS he found some finches (birds) that helped him understand and explain EVOLUTION. Many other things he observed made him sure that EVOLUTION really takes place.

Please turn back to (4) on page 30.

F and G

The difference between GENUS and SPECIES might be hard to remember at first. Let's try again:

GENUS: An example is lions, tigers, and alley cats. They are in the same GENUS. They are generally alike but they have differences, too. We can tell them apart even though they are related.

SPECIES: An example is 7 sheep. They are specifically alike. They may vary in size or color, but they are alike in important ways. They are all sheep; they are one SPECIES.

During the 5 years that Darwin was on the Beagle, over and over he saw variations in species of animals. For example, he saw that finches living where seeds were plentiful had heavy bills to crack the seeds; he saw that finches living in places where there were lots of insects had thin bills! Darwin thought, "IT LOOKS LIKE THE FINCHES HAVE BECOME DIFFERENT SO THAT THEY ARE BEST SUITED TO LIVE IN THEIR NATURAL SURROUNDINGS."

Many of the species of animals and plants that Darwin saw as he travelled varied. In one area, a certain species of fish would be different from the same species of fish in another place. Again he wondered, "IS IT POSSIBLE THAT THESE FISH WERE ONCE UPON A TIME EXACTLY ALIKE? COULD THEY HAVE BECOME CHANGED DUE TO THE ENVIRONMENT THEY LIVE IN?"

Put X by the sentence that best describes Charles Darwin's thoughts:

_____ 1. Plants and animals are alike in all parts of the world.

(turn to page 34)

_____ 2. The location where animals and plants live may affect what they look like.

(skip page 34 and turn to page 35)

WRONG

-34-

Here is why your answer is not right:

On his trip, Charles Darwin found that the same species of a plant or animal would look very different, depending upon where the plant or animal was living. This is one thing that made Darwin begin to wonder how life on earth began and how living things had changed over millions of years.

Now turn back to page 33 and choose another answer.

Yes, Darwin thought that over millions and millions of years, animals and plants slowly change to fit their environments or surroundings.

When Charles Darwin returned to England, he studied books written by a man named THOMAS MALTHUS. This person was interested in the connection between human population and food supply. MALTHUS wrote that more people were being born than could be fed on the food being produced.

He thought that disease, wars, and all sorts of disasters that kill people are necessary to prevent too much population increase. If there were no such disasters, MALTHUS believed that all people on earth would have to live in the worst kind of poverty.

This theory that says that disease, wars, and other disasters are useful to prevent human overpopulation and poverty is called the MALTHUSIAN THEORY. The MALTHUSIAN THEORY was named for its author, THOMAS MALTHUS.

Go to page 36.

See how well you can match these. You will not use all of the numbers.

- | | |
|----------------------------|---|
| _____ A. Genus | 1. The slow change in living things over a long period of time |
| _____ B. Malthus | 2. He gave the first scientific explanation of evolution |
| _____ C. Malthusian Theory | 3. One of the two scientific names given to every plant and animal |
| _____ D. Darwin | 4. The name of an English ship |
| _____ E. Evolution | 5. He thought that disasters prevent human overpopulation and poverty |
| | 6. This is the theory named for Malthus |
| | 7. He was a cultural anthropologist |

Turn the page when you fill in the blanks.

Answers:

3 A.

5 B.

6 C.

2 D.

1 E.

CAREFULLY check your answers. Wait! Put X by every question you missed.

If you did not miss any, turn right now to page 39. If you missed one or more, turn to page 38.

Before we go any further, I want you to study this page.

PEOPLE YOU SHOULD KNOW

1. CHARLES DARWIN gave a scientific explanation of evolution.
2. THOMAS MALTHUS thought that events like disease, floods, wars, and other disasters kept the earth from being too crowded with people.

WORDS YOU SHOULD KNOW

1. BINOMIAL SYSTEM: A method of classifying animals and plants by giving them 2 names: a genus name and a species name. The binomial system name of the tiger is Felis tigris. Felis is the genus name; tigris is the species name.
2. GENUS: A group of animals that are related but which can be divided into smaller groups. Horses, donkeys, and zebras are in the same genus.
3. SPECIES: A group of animals that are all the same kind: a group of squirrels would be all of the same species.

THEORIES YOU SHOULD KNOW

1. EVOLUTION: Charles Darwin's scientific explanation of the slow change in living things over the years.
2. MALTHUSIAN THEORY: Malthus' belief that disasters keep the world from being too crowded with people.

Darwin decided that something like the Malthusian theory occurs in all of nature. He had noticed that

1. more eggs are laid than are ever hatched
2. plants produce more seeds than ever sprout
3. more animals are born than live to be adults

I wonder if you knew that. It may surprise you to know that one female house fly may lay as many as 1,000 eggs. Now just imagine! If every single egg hatched, and if every single newly hatched fly lived to be an adult, we would soon be "overrun" with flies! Fortunately for us, many of the eggs don't hatch, and many flies die or are killed before they become adult.

In nature, there are always more eggs and seeds produced than actually ever become living, adult things. This fact is a very important key to evolution. Darwin got this idea from the Malthusian theory.

When Darwin realized that there were more animals and plants produced than would grow to adulthood, he knew this would help him explain evolution. He knew this overproduction of life could explain the slow change in animals and plants through the years.

Let me give you an example:

Suppose 6 baby rabbits are born in a grassy field. 4 of the rabbits are brown, and 2 of them are almost all white. Suppose they are now about a week old. They can see and they can hop but they are still not grown. Now, suppose a fox comes along and sees the rabbits and runs after them. All the rabbits hop away to hide. The 4 brown ones are hard for the fox to see in the tall grass, but the 2 white ones can easily be seen. The fox catches the 2 white rabbits that he sees. Now there are 4 rabbits left; they are all brown. The 4 that are left are better prepared to live in the field than the 2 that got caught. Darwin called this NATURAL SELECTION. All that NATURAL SELECTION means is that those that are best suited or adapted have the best chance of living to adulthood and having children, and those not as well adapted are not likely to live.

NATURAL SELECTION is a process that is found in all of nature. More eggs or seeds are produced than will grow to adulthood, and only the best adapted or suited remain alive.

In the example I just gave you, the brown rabbits were better adapted (adapted means suited or fitted) to an environment where there is grass and where there are foxes that enjoy a meal of baby rabbits.

Now, let's imagine another family of rabbits (4 brown ones and 2 mostly white ones). These rabbits are born in the VERY FAR NORTH where snow is on the ground all year long. In this environment, the 2 white rabbits will have the best chance of surviving because their white fur will make them harder to see in the snow. It is the brown ones that are likely to be killed here. In this case, the white rabbits are better adapted to the northern climate.

The better adapted an animal or plant is to its surroundings, the better are its chances of growing up. The better adapted plants and animals survive and reproduce; Darwin called this process NATURAL SELECTION.

Fill in the blanks:

1. A classification system for living things which uses two scientific names for each thing is called a _____ system.
(cultural, physical, binomial)
2. The two scientific names which are given to all plants and animals are the genus and the _____ (species, binomial, Malthusian) name.
3. Many more living things start life than grow up. Charles Darwin thought the things that live are the ones that are best _____ to their environment.
(varied, adapted, related)

Answers:

1. binomial
2. species
3. adapted

Put X by the questions you missed. If you missed any, write the correct answers on the lines at the bottom of page 42.

You may be wondering what this all has to do with evolution. This booklet is supposed to be about evolution, which is the slow change that occurs in animals and plants over a long period of time.

Let's go back to the 6 rabbits we talked about:

I said that 6 rabbits were born in a grassy field; 4 were brown and 2 were mostly white. The brown ones could hide from their enemies and not be seen as easily as the white ones, so the brown ones lived. Imagine 1,000 rabbit families just like this. The white babies get killed off, and the brown ones grow up and mate to raise other rabbits. Imagine that this happens over and over. At long last, after a long, long time only brown baby rabbits are born. This is a result of NATURAL SELECTION. The rabbits that are best adapted to their surroundings are the ones that grow up and raise families.

Imagine another group of 6 rabbits; 4 brown ones and 2 mostly white ones, born in a snowy, northern land. In this environment, it would be the white bunnies that are better adapted because enemies cannot see them against the white snow very easily. The white rabbits would be the best adapted; they would be the ones to survive and have families. Their offspring would tend to be white, also. After many, many families like this, only white rabbits would be born in that environment.

This is the process that Darwin called EVOLUTION. Over years and years, the rabbits born in the north would be mostly white, and the rabbits born in less cold climates would be brown.

Darwin thought that this evolution or change happens to all living things, both plants and animals.

Remember the finches? In the Galapagos, Darwin saw finches that looked like this  and finches that looked like this . Here is how the changes took place:

Suppose that once upon a time, all finches had beaks alike. Let's just suppose they were not really very thin or not really very heavy. Let's say that they looked something like this: . Now imagine that some of the finches were on an island in the Galapagos where there were very few insects, but there were plenty of plants that had hard, edible seeds. Suppose a nest of finch eggs were hatched and some of the baby birds had fairly thick beaks and some had much thinner beaks. When the birds left the nest, those that had heavy bills could crack open seeds to eat them. The birds with the thinner beaks could not crack seeds, and so they probably starved. The birds with the heavier beaks grew up and mated, and some of their offspring probably had heavy beaks like their parents. Then this same thing happened all over again. The birds with heavy beaks lived and raised families, and the birds with thin beaks did not survive. After hundreds and hundreds of years of this same thing happening, most of the birds on the island would have heavy bills like this .

Please fill in the blanks so that the following will be correct. DO NOT LOOK AT ANY OTHER PAGE UNTIL YOU FINISH.

On some of the Galapagos Islands (1) _____
(Malthus; Darwin)

found finches with pointed, thin beaks. This means that on these islands the most plentiful food for the finches was

(2) _____. Perhaps thousands and thousands
(seed; berries, insects)

of years ago the finches' beaks were not thin, but over the

years, those born with (3) _____ beaks did
(heavy, thin, yellow)

not survive, and those born with (4) _____
(heavy, thin, yellow)

beaks lived to adulthood.

The birds with thin beaks grew up and mated. Some of their offspring had heavy beaks and some had thin beaks. Again,

the finches that had (5) _____ beaks were
(heavy, thin, yellow)

the ones that lived to adulthood.

Over and over and over this same process happened. After thousands of years, all the finches on these islands had thin

beaks. The slow change that took place in the shape of the

finches' beaks is called (6) _____
(evolution, culture, archeology)

Answers:

1. Darwin
2. insects
3. heavy
4. thin
5. thin
6. evolution

Put X by the ones you missed.

Did you miss any?

_____ Yes (read the rest of this page)

_____ No (turn to the next page right now)

Don't feel too bad about missing some. Often people learn by making mistakes.

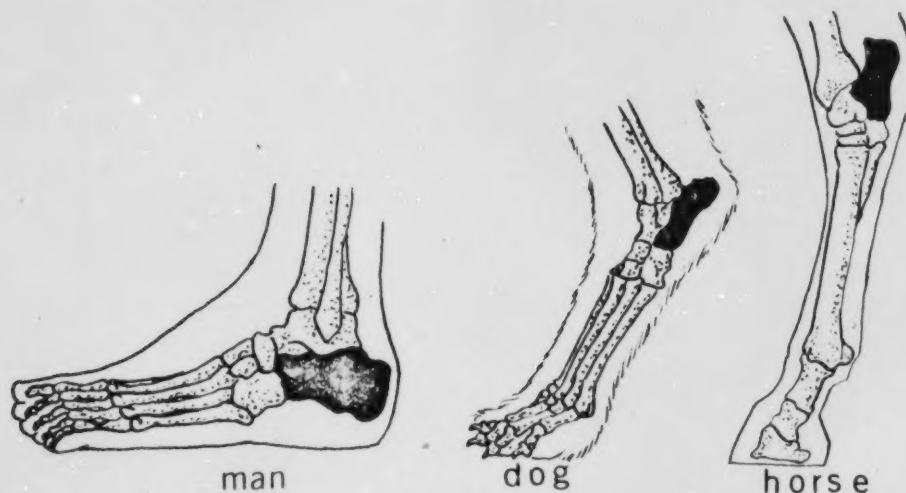
On page 46 you were reading about birds on one of the Galapagos Islands with thin, pointed beaks. This is the kind of beak that insect-eating birds have because they are the best beaks for getting insects.

Perhaps thousands and thousands of years ago the finches on this island did not have thin beaks. Very, very slowly evolution or change occurred so that now the finches in this particular place do have beaks that are best for eating insects.

Evolution or change takes place in all of nature. Things change so that they are better adapted or suited to their surroundings.

Charles Darwin studied and thought about all the things he had seen on the Beagle trip. He also studied COMPARATIVE ANATOMY.

COMPARATIVE ANATOMY is the study of how different species of animals are alike and yet different in their structure. In COMPARATIVE ANATOMY you might learn how a bee's eye, an elephant's eye, and a chicken's eye are alike and different. You might study how the feet bones of a man, a dog, and a horse are alike and how they are different. Here are some sketches of the bones in the feet.



In comparative anatomy, you would be interested in how these are alike and different. These are the kinds of questions you would find answers to: (see if you can answer them with either "yes" or "no")

1. Are they the same size? _____
2. Do they have the same number of toes? _____
3. Are the feet or toes all shaped alike? _____

Different body structures of all sorts of animals are studied and compared in comparative anatomy.

Some people who study COMPARATIVE ANATOMY are interested in the bodily structure of ancient animals. Bones and other materials have been found which are thousands and thousands of years old. By COMPARATIVE ANATOMY it has been learned that some kinds of animals that used to live on earth are now EXTINCT.

EXTINCT means "no longer living." For example, we know that dinosaurs used to live on earth but now they are EXTINCT. There is no such thing as a living dinosaur today.

COMPARATIVE ANATOMY and the study of EXTINCT animals helped Darwin with his ideas about evolution.

Darwin used his ideas about evolution and the ideas, thoughts, and knowledge of many other people who had lived before him. He took all these ideas and thoughts, and he wrote a book on evolution.

The name of the book is
ON THE ORIGIN OF SPECIES BY MEANS OF NATURAL SELECTION.

That whole name is too long to try to remember. Most people shorten it to

THE ORIGIN OF SPECIES.

Take a little time to look at that name carefully. Try to remember it. It is the name of one of the greatest scientific books ever written.

Remember:

CHARLES DARWIN WROTE THE ORIGIN OF SPECIES. IT IS A BOOK ABOUT EVOLUTION.

Darwin wrote his book, The Origin of Species, over 100 years ago. Since then, people have gathered a lot more information than Darwin had, and today we have a SYNTHETIC explanation of evolution. Anything that is synthetic is made up of different parts and put together in a clear and reasonable way.

Our synthetic explanation of evolution is made up of Darwin's ideas PLUS a number of other ideas. I will tell you about some of these other ideas, but first, let's see how much you have learned.

I have told you about a lot of different things. See how well you remember them. Don't look on any other page until you finish.

- | | |
|-----------------------------------|--|
| _____ A. comparative anatomy | 1. no longer living |
| _____ B. extinct | 2. a book written by Malthus |
| _____ C. <u>Origin of Species</u> | 3. the study of how animals are alike and not alike in their structure |
| _____ D. evolution | 4. made up of different parts and put together in a clear way |
| _____ E. synthetic | 5. a book written by Darwin |
| | 6. the slow change in living things over a long time |

Turn the page after you finish.

Answers:

3 A.

1 B.

5 C.

6 D.

4 E.

Put X by the ones you missed.

Did you miss any?

 No (Good! Turn the page right now.)

 Yes (Read the rest of this page)

A. Comparative anatomy is the study of how animals are alike and not alike in their physical structure. In comparative anatomy, you might study and compare the stomachs or the teeth or the backbones of a cat, a skunk, a horse, and a man.

B. The word, extinct, means "no longer living." A good example is the dinosaur. They used to live on earth, but now they are extinct. They have all died out; dinosaurs are no longer living.

C. Origin of Species is the name of Charles Darwin's very famous and important book on evolution.

D. Evolution is the slow change in living things over a long period of time.

E. Synthetic means "made up of different parts and put together in a clear way."

Since the book, THE ORIGIN OF SPECIES, was written a lot of new information has been added to Darwin's ideas about evolution. Today, we know things that Darwin did not know 100 years ago. We have added this new knowledge to Darwin's ideas and today we have a SYNTHETIC explanation of evolution. This means we have an explanation of evolution that is made up of different parts and put together in a clear way.

Here is a list of some of the parts of the synthetic explanation of evolution:

1. Inheritance and genes
2. Mutations
3. Genetic drift
4. Migration

Don't try to learn this list now. Soon I will tell you something about each of them.

Now, you tell me the name of Darwin's book on evolution (the answer is on this page!).

Darwin's book is The _____.

(Fill in the blanks)

Answers:

The Origin of Species

If you did not spell it correctly, write it again on the line below:

INHERITANCE AND GENES

Plants and animals look like their parents. Probably you have heard someone say, "He looks just like his mother," or maybe, "She got her red hair from her father." Children or offspring often have the same characteristics as their parents. They INHERIT characteristics from their parents. Plants inherit characteristics from their parents just as animals do.

To INHERIT means "to receive from the parents."

How do offspring INHERIT things? How does a child "get his blue eyes from his father?"

Each parent gives thousands of chemical units called GENES to the offspring. Exactly half of your GENES came from your mother and exactly half came from your father.

You and I have never seen a GENE, but they are chemical units that control the appearance of plants and animals. It is your GENES that make you look the way you look.

There are lots of things I could tell you about GENES, but here are the important things I want you to remember:

1. GENES are chemical units that cannot be seen.
2. Half of the genes are given by one parent and half of the genes are given by the other parent.
3. It is the combination of genes that gives the offspring its appearance.

Here are some true-false statements. Read them CAREFULLY
and mark them "true" or "false."

- _____ 1. Both parents give GENES to their offspring
but the mother gives many more than the father.
- _____ 2. The word, EXTINCT, means "no longer living."
- _____ 3. The color of your hair and eyes is a result
of the GENES you received from your parents.
- _____ 4. Plants and animals INHERIT characteristics
from their parents.
- _____ 5. GENES are chemical units which cannot be seen.

Turn the page when you finish.

Answers:

1. False
2. True
3. True
4. True
5. True

Put X by each one you missed. If you got them ALL correct, turn to page 59 right now. If you missed any of them, read the numbers below that you missed:

1. Both parents give GENES to their offspring, but the mother gives many more than the father. This is FALSE. The truth is that exactly half of the GENES come from the father, and exactly half of the GENES come from the mother.
2. The word, EXTINCT, means "no longer living." This is TRUE. Dinosaurs have died out; they are no longer living on earth. They are extinct.
3. The color of your hair and eyes is a result of the GENES you received from your parents. This is TRUE. Such things as hair, eye, and skin color, and height and weight are controlled by the GENES your parents gave you.
4. Plants and animals INHERIT characteristics from their parents. This is TRUE. GENES are the units by which characteristics, such as eye color, hair color, and other characteristics are passed from parent to offspring.
5. GENES are chemical units which cannot be seen. This is TRUE.

MUTATIONS

A MUTATION is a change in the chemical makeup of genes.

Most of the time, as you know, evolution is the slow change that takes place in living things over hundreds and hundreds of years. Changes in the chemicals in the genes called MUTATIONS cause sudden changes in evolution.

Most MUTATIONS are harmful and cause the death of the plant or animal. Some few mutations are good.

The moths near a town in England are an example of how mutations can sometimes be desirable. These moths spend a lot of time on the bark of trees. At one time, the moths were all very light colored. The bark of the trees was light, too. It was hard to see the light moths against the light bark. Once in a while a mutation would occur and a dark moth would hatch.

Gradually, as factories were built and the smoke from the factories became thicker, the bark of the trees became darkened by the soot and smoke. Birds could now more easily find and eat the light colored moths. Natural selection favored the survival of the dark moths that were mutations. Today, practically all of the moths in that place are dark colored.

These moths are an example of how MUTATIONS and NATURAL SELECTION work together in evolution.

Remember, though, that MOST mutations are NOT good.

Let me review the most important things about MUTATIONS:

1. MUTATIONS are changes in the chemicals of the genes.
2. MUTATIONS cause sudden changes in evolution.
3. There are many, many more bad MUTATIONS than there are good or desirable ones.

GENETIC DRIFT

Genetic drift is the accidental loss of genes possessed by a group.

Imagine a small group of Eskimoes living in a place that is isolated from other people. Suppose this happens: only one Eskimo has the GENES for blue eyes. He is a young man and he has no children. He gets killed on a hunting trip. Since he was the only one who had the genes for blue eyes and since he is dead, there is no longer any possibility of an Eskimo with blue eyes being born in that group. This is an example of GENETIC DRIFT.

Genetic drift is the accidental loss of genes that a group once had.

Fill in the blanks:

1. You inherited your appearance from your parents. The chemical units which control what you look like are called

(mutations, genes, synthetics)

2. Sometimes genes are accidentally lost forever from a group. When this happens, we call it

(inheritance, mutation, genetic drift)

3. The slow change in living things over thousands and thousands of years is called

(synthetics, Malthusian theory, evolution)

4. Sometimes there are chemical changes in the genes; the chemical changes in the genes are called

(mutations, evolutions, extinctions)

5. _____ mutations are harmful or bad.

(Most, Few, No)

Answers:

1. Genes
2. Genetic Drift
3. Evolution
4. Mutation
5. Most

Put X by the ones you missed.

Did you miss any?

_____ Yes (read the rest of this page)

 X No (turn right now to page 63)

Sorry you missed some. Go back to page 61 and circle the right answers on each question. After you have circled the answers, read each question again.

Parts of the synthetic explanation of evolution are

(1) genes and inheritance (2) mutations and (3) genetic drift.

The last part of the synthetic explanation is MIGRATION.

I bet that you know what MIGRATION means. It is moving in or out of a place or a group. The pilgrims MIGRATED to this country. Birds MIGRATE to the south in the winter and to the north in the summer.

MIGRATION is the coming into or going out of a place or a group.

The important point is that MIGRATION can add to or take away from the genes in a group. As animals move into and out of different groups, their genes go with them. When new animals come to a group, there are more genes. When animals leave a group, there are less genes.

I have told you something about each of these:

GENES

MUTATIONS

GENETIC DRIFT

MIGRATION

Use them to fill in these blanks:

1. The only brown colored squirrel on an island is shot.

Since this squirrel is dead, there can be no more brown squirrels born on this island. This is an example of _____.

2. Sometimes men and other animals move into or out of a group.

This adds to or subtracts from the genes in the group. This is called _____.

3. The change in the chemistry of a gene is called _____.

4. The unseen little chemical units that control what you and I look like are called _____.

Answers:

1. genetic drift
2. migration
3. mutations
4. genes

Put X by those you missed.

Did you miss any?

_____ Yes (read the rest of this page)

_____ No (turn to page 66 right now)

Maybe you are rushing too much. Take your time and do your best!

Put an X by the ones you missed

_____ Question 1 (turn back and re-read page 60)

_____ Question 2 (turn back and re-read page 63)

_____ Question 3 (turn back and re-read page 59)

_____ Question 4 (turn back and re-read page 56)

Be sure you do what I tell you. When you follow all the directions above, you may turn the page to 66.

SPECIALIZED AND GENERALIZED ANIMALS

Some animals get along well only in a certain environment.
Other animals can adapt to all sorts of environments.

SPECIALIZED animals are adapted to one special environment. Polar bears live in cold climates, but they are not adapted to warm climates. Polar bears are an example of SPECIALIZED animals.

GENERALIZED animals can adapt to many environments. MAN is an example of a GENERALIZED animal. Man can live in hot climates, cold climates, wet climates. MAN is a GENERALIZED animal because he can live in various environments or surroundings.

Use these words to fill in the blanks:

GENERALIZED

SPECIALIZED

1. A _____ animal can adapt to a lot of different environments.
2. Animals that can only live in special surroundings are called _____ animals.

Answers:

1. Generalized
2. Specialized.

Put X by those you missed.

Man is a GENERALIZED animal. He is able to live in many environments. One important reason why he can adjust to his surroundings is his CULTURE. He makes tools, he can speak a language, he can write; these are parts of man's CULTURE. With his tools, he has been able to change his environment so that he can live in it. He uses tools to build houses to protect himself from unpleasant climates. He tells others what he has done so they can copy him. He writes down things he knows so that people who live after him can have his knowledge. Man's CULTURE is one important reason he is a GENERALIZED animal.

Here is a matching test. Take your time and see how well you do! Mark out the numbers as you use them. You will not need to use all the numbers.

- _____ A. Specialized animal
- _____ B. Species
- _____ C. Malthusian theory
- _____ D. Genus
- _____ E. Generalized animal
- _____ F. Inherit
- _____ G. Comparative anatomy

1. the scientific name given to a group of animals that are specifically alike. Seven reindeer are an example
2. the study of man and his culture
3. an animal that can only live in a particular environment
4. an animal that can adapt to many environments
5. the study of how animals are alike and how they are unlike in the way they are made. An example would be to compare the teeth of a cat, a dog, and a man
6. the belief that all living things change over a period of time
7. the belief that wars, floods, and other disasters keep the earth from becoming too crowded with people
8. this word means "to receive from the parents"
9. the scientific name given to a group of animals that are generally related, but which can be divided into smaller groups. Lions, tigers, and leopards are an example

- 3 A.
1 B.
7 C.
9 D.
4 E.
8 F.
5 G.

Did you get them ALL correct?

_____ Yes (turn the page right now)

_____ No (then read the rest of this page)

Sorry you missed some of the questions. Here are the correct answers. READ the ones you missed! Don't try to skip any that you missed.

- A. Specialized animal - an animal that can only live in a particular environment.
- B. Species - the scientific name given to a group of animals that are specifically alike. Seven reindeer are an example.
- C. Malthusian theory - the belief that wars, floods, and other disasters keep the earth from becoming too crowded with people.
- D. Genus - the scientific name given to a group of animals that are generally related, but which can be divided into **smaller** groups. Lions, tigers, and leopards are an example.
- E. Generalized animal - an animal that can adapt to many **environments**.
- F. Inherit - this word means "to receive from the parents."
- G. Comparative anatomy - the study of how animals are alike and how they are not alike. An example would be to compare the teeth of a cat, a dog, and a man.

WAIT! Did you read them carefully and try to understand them?

If not, go back and read them again.

Can you guess how old the earth is? Not many people can!
You can learn how old it is, then you can ask someone in your
family and see if he knows.

The earth is 4 1/2 BILLION years old.

Maybe this will help you remember:

"Beginning" and "Billion" both start with a "B." The earth
began billions of years ago.

Remember, it began almost as many billions of years ago as
you have fingers on one hand. You have 5 fingers; 4 1/2 fingers is
almost 5.

THE EARTH BEGAN 4 1/2 BILLION YEARS AGO.

DO NOT look at any other page. Can you answer this question?

How old is the earth? _____ years old.
(your answer)

Now turn the page.

Answer:

4 1/2 billion

Did you get it exactly right?

 Yes (read below)

 No (turn back to page 71 and write the correct
 answer on the line at the bottom of the page)

When the earth was formed, 4 1/2 billion years ago, there was
no life on it at all.

Life on earth began a little over 550 million years ago.

You are going to have to think hard to keep these straight.

Can you do it? I think you can!

The earth is 4 1/2 billion years old.

Life on earth is 550 million years old.

Here is the way I remember these numbers. Maybe it will help you.

I know that there had to be an earth before there could be anything living on it, so earth comes first. Put EARTH first, like this:

1. EARTH
2. LIFE

Then I think of numbers. I know that $4\frac{1}{2}$ comes before 550. So then I have:

1. EARTH - $4\frac{1}{2}$
2. LIFE - 550

Then I alphabetize the words, "Million" and "Billion".

I know that billion comes before million. So then I have:

1. EARTH - $4\frac{1}{2}$ billion
2. LIFE - 550 million

Maybe my little trick will help you remember these numbers!

I hope I've helped you learn 2 groups of numbers that you won't forget. Let's practice.

1. How long has there been life on the earth? _____
_____ years.
2. How old is the earth? _____ years
old.

When you finish, turn the page.

Answers:

1. 550 million
2. 4 1/2 billion

I surely hope you got these right! Remember, the earth came first. It is 4 1/2 billion years old. Life came after that. Life on earth began 550 million years ago.

Scientists have given names to the different periods of time. Sometime you may study all the different periods. Now, I want to tell you the names of just a few of them.

The CAMBRIAN period began when life began, so the PERMIAN period began _____ years ago.
(fill in the blank)

Answer:

550 million

If you missed this, write the correct answer on the line at the bottom of page 75.

The first living things were tiny creatures that lived in the oceans and seas. It was in the CAMBRIAN period when these creatures first appeared.

Slowly over millions of years, evolution caused a slow change in these tiny fish-like creatures that could not live on land. It was many more millions of years of evolution before some animals came out of the water and lived on land. From these land animals, after more millions of years of evolution came the dinosaur. It was not until the PALEOCENE Period, 75 million years ago, that mammals became numerous.

Anthropologists do not know exactly when MAN appeared. It was either at the end of the

PLIOCENE PERIOD

or at the beginning of the

PLEISTOCENE PERIOD.

Let's go over this again. Use the list to fill in the blanks:

550 million

4 1/2 billion

Pleistocene

Cambrian

Paleocene

1. The period when the earth first had tiny living creatures is called the _____ period.
2. The earth is about _____ years old.
3. Living things have been on earth about _____ years.
4. Mammals became numerous during the _____ period.
5. Man appeared on earth at the end of the Pliocene period or the beginning of the _____ period.

Answers:

1. Cambrian
2. 4 1/2 billion
3. 550 million
4. Paleocene
5. Pleistocene

Put an X by the ones you missed.

During the Cambrian period, life began. During the Paleocene period, mammals became numerous. The mammals are a group of hair covered animals which give birth to living animals and feed them with their milk. During either the Pliocene period or the Pleistocene period, Man appeared.

Maybe you are wondering how we know what happened millions and millions of years ago. Well, we study the traces and remains of the plants and animals that lived then.

These traces and remains are called FOSSILS. A FOSSIL can be the bones of an ancient animal. A FOSSIL is any sort of remains or trace of things that lived many years ago.

By studying FOSSILS, we can learn a lot about what the earth was like millions of years ago.

We have found bones of men who lived over a million years ago. From little evidence, paleontologists have been able to gain much insight into prehistory. Paleontology is the study of prehistoric life through fossil evidence.

From the bones we can learn a lot about early man. We can learn about his height, his weight, and his posture. By studying the size of his skull, we can even get an idea about how smart he was.

Since FOSSILS are usually the hard parts of animals like bones and teeth, we cannot find out such things as the color of the skin, or the color of the eyes, or how much hair he had. Hair and skin and soft parts of the body do not last for millions of years, but bones and teeth can last that long.

People who draw pictures of early man often color the skin and eyes and hair. They are just guessing because there is no way to find out these things about early man.

The study of prehistoric life through fossil evidence is called

(The answer is on this page.)

Let's go back to the periods I want you to know about.

The CAMBRIAN period was the beginning of life. It was 550 MILLION years ago. It was not until the Paleocene period that mammals became numerous.

Then man appeared either the last part of the PLIOCENE period or the first of the PLEISTOCENE period.

Today, we live in the HOLOCENE period. The HOLOCENE period is called "modern times."

Here are the 5 periods I have told you about:

CAMBRIAN

PALEOCENE

PLIOCENE

PLEISTOCENE

HOLOCENE

Use these words to fill in the blanks. Don't look on any other page!

HOLOCENE

PLEISTOCENE

PLIOCENE

CAMBRIAN

PALEOCENE

FOSSILS

PALEONTOLOGY

1. Man appeared on earth during either the _____ period or the _____ period.
2. The first life appeared on earth during the _____ period.
3. You and I are living in Modern Times or the _____ period.
4. Mammals became numerous during the _____ period.
5. Traces and remains of plants and animals that lived many years ago are called _____.
6. The study of prehistoric life through fossil evidence is called _____.

Answers:

1. Pliocene and Pleistocene (or Pleistocene and Pliocene)
2. Cambrian
3. Holocene
4. Paleocene
5. Fossils
6. Paleontology

Check your answers and put X by those you missed.

1. Did you miss 1, 2, 3, or 4?

_____ No (read question 2 below)

_____ Yes (go back and read page 80, then read the rest of this page)

2. Did you miss 5 or 6?

_____ No (read the rest of this page)

_____ Yes (go back and read page 79, then read the rest of this)

Because man was living during the Pleistocene period, I want to tell you about the climate and animals during that time.

The Pleistocene period is also called THE ICE AGE. During the Pleistocene there were 4 times when large parts of the earth were covered by GLACIERS or huge sheets of ice. Naturally, the climate was very, very cold. The animals that lived then were like the animals that are in the arctic regions today. Only animals adapted to very cold weather lived during the glacier periods.

There were 4 different glacier periods that lasted thousands of years during the Pleistocene period.

Between the glacier periods there were very warm periods. These warm periods are called INTERGLACIALS. These INTERGLACIALS lasted for thousands of years, too.

The animals that lived during the warm interglacials were like the animals that live in Africa today. They were animals that adapted to the warm climate of the interglacials.

There were 4 glacial periods in the PLEISTOCENE. Each glacier was followed by an interglacial. The weather was COLD during the glaciers and WARM during the interglacials.

The Pleistocene is sometimes called the Ice Age.

Fill in the blanks:

1. Another name for the ICE AGE is the (Holocene, Pleistocene, Pliocene) period.
2. There were four glaciers during the (Holocene, Pleistocene, Pliocene) period.
3. The glaciers during the ICE AGE lasted for (thousands, a couple, billions) of years.
4. The weather was different during the interglacials from the weather during the glacier periods. During the interglacials, it was (colder, warmer, stormy).
5. The period you and I live in is the (Holocene, Pleistocene, Pliocene) period.

Answers:

1. Pleistocene
2. Pleistocene
3. thousands
4. warmer
5. Holocene

Place X beside those you missed. Now turn to page 86.

On the last page of this book you will find a TIME CHART. This chart shows how man and the other animals of today developed through EVOLUTION.

Turn to the TIME CHART and look at the left column. Look from the bottom to the top. Fill in the blanks below with the words you see in capital letters in that column of the chart. The three words are:

P _____ I C
M _____ I C
C _____ I C

The three words you should have written are:

PALEOZOIC

MESOZOIC

CENOZOIC

Did you get them right?

_____ Yes (turn the page)

_____ No (copy them on the three lines below)

NOW TURN THE PAGE.

These three names are the names of three divisions of TIME.

The PALEOZOIC came first.

The MESOZOIC came next.

The CENOZOIC came next.

Look at the chart again. Look at the left column again. You will see that the PALEOZOIC is called the Age of Ancient Life.

Use the chart to help you fill in the following blanks:

1. The MESOZOIC is the Age of _____.
2. The CENOZOIC is the Age of _____.

The correct answers are:

1. The MESOZOIC is the Age of Reptiles.
2. The CENOZOIC is the Age of Mammals.

Put an X by those answers you missed on page 87. Then read the rest of this page.

PALEOZOIC - Age of Ancient Life

MESOZOIC - Age of Reptiles

CENOZOIC - Age of Mammals

Take a little time to look at the chart all over. There are 3 Ages, and each have several time periods. I would like you to know a few of the time periods. Look at the periods that are outlined like this:

* *

There are five periods which are outlined on the chart from bottom to top. Look at them carefully. Now fill in the blanks below with these names.

C _____ N
P A _____ E
P L I _____ E
P L E _____ E
H _____ E

The five words you should have written are:

CAMBRIAN _____

PALEOCENE _____

PLIOCENE _____

PLEISTOCENE _____

HOLOCENE _____

Put X by the ones you missed. Did you miss any?

_____ No (Good! Turn the page right now.)

_____ Yes (Copy the words on the blanks next to the
answers above. Then turn the page.)

Let me help you with the important information from the chart.
Here is what you need to know:

1. Paleozoic Age (Ancient Life) includes Cambrian period
2. Mesozoic Age (Reptiles)
3. Cenozoic Age (Mammals) includes Paleocene, Pliocene,
Pleistocene, and Holocene

Copy this information on the blanks below. Then turn to
the next page.

1. Paleozoic Age (_____) includes
_____ period
2. Mesozoic Age (_____)
3. Cenozoic Age (_____) includes
_____, _____,
_____, _____.

Fill in the blanks.

1. The Paleozoic Age is the Age of _____.
_____. It includes the _____
period.
2. The Cenozoic Age is the Age of _____.
It includes the _____,
and _____ periods.
3. The _____ Age is the Age of Ancient Life.
4. The _____ Age is the Age of Mammals.
5. The Age of Reptiles is the _____ Age.

Turn to the next page and check your answers.

ANSWERS:

1. Ancient life, Cambrian
2. Mammals, Paleocene, Pliocene, Pleistocene, Holocene
3. Mesozoic
4. Cenozoic
5. Mesozoic

Check your answers carefully. Did you miss any?

_____ Yes (Draw a line through each wrong answer on
page 91 and write the correct answer above it.)

_____ No (Turn to the next page)

Here are some questions to see how well you know the material in the chart.

1. The 3 major divisions of evolutionary time are:

_____, _____,
and _____.

2. During the Mesozoic Age, the earth was dominated by

_____.

3. The Cambrian period was a part of the _____
Age.

4. Name 4 periods which are a part of the Cenozoic Age:

_____, _____,
_____, _____.

Check your answers on the next page.

Answers

1. Paleozoic Age, Mesozoic Age, Cenozoic Age
2. Reptiles
3. Paleozoic Age
4. Paleocene, Pliocene, Pleistocene, Holocene

Did you miss any?

_____ Yes (Put an X by the wrong answers. Turn back to page 90 and study the information. Then try to answer the questions on page 93 again. Write the correct answers above the ones you missed on page 93.)

_____ No (GOOD! You have finished the book.)

Now you know about evolution. I hope you had fun while you learned.

GEOLOGIC TIME CHART

GEOLOGIC TIME PERIODS		began years ago	EVENTS
CENOZOIC Age of the Mammals	HOLOCENE	10,000	Rapid expansion of human culture.
	PLEISTOCENE	1,000,000	Extinction of many large mammals. Modern man appears. 4 Glacials, 3 Interglacials.
	PLIOCENE	72,000,000	Early man appears.
	MIOCENE	30,000,000	Increase in types and numbers of the great apes.
	OLIGOCENE	40,000,000	Evolution of modern mammals. Primate evolution begins.
	EOCENE	60,000,000	Horse ancestor appears.
MESOZOIC Age of Reptiles	PALEOCENE	75,000,000	Rapid evolution and increase in types and number of mammals.
	CRETACEOUS	120,000,000	Extinction of dinosaurs.
	JURASSIC	155,000,000	First primitive mammals and birds appear. Dominance of the dinosaurs.
	TRIASSIC	190,000,000	Evolution of dinosaurs.
PALEOZOIC Age of Ancient life	PERMIAN	215,000,000	Great increase in the reptile groups.
	CARBONIFEROUS	300,000,000	Reptiles evolve from the amphibians. Increase in types and number of amphibians.
	DEVONIAN	350,000,000	Amphibians (land-water animals) evolve from fish. First land animals.
	SILURIAN	390,000,000	First known land plants.
	ORDOVICIAN	480,000,000	First fish-like vertebrates. (animals with backbones)
	CAMBRIAN	550,000,000	Invertebrate life in oceans and seas (tiny sea creatures).

PRONUNCIATION GUIDE

FOR
EVOLUTION

by

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HOW TO USE THE PRONUNCIATION GUIDE

Words that you need to know how to pronounce in Evolution, a programmed text, are listed in columns in the following pages. The words are first printed as you will read them in the text. Then each word is divided into syllables to help you learn to pronounce it.

Your teacher will play a tape recording of the words so that you can hear the words and practice saying the words.

After you have learned to pronounce the words, you will study a special kind of text called a programmed text that will explain the meanings of the words.

While you are studying the text, you may want to review the tape by yourself or with some other students.

WORDS FROM EVOLUTION PROGRAMMED TEXT

WORDS	DIVIDED INTO SYLLABLES
1. anthropology	an-thro-pol'-o-gy
2. evolution	ev-o-lu'-tion
3. Galapagos	Ga-la'-pa-gos
4. Malthusian	Mal-thu'-sian
5. binomial	bi-no'-mi-al
6. genus	ge'-nus
7. species	spe'-cies
8. genetic	ge-net'-ic
9. mutation	mu-ta'-tion
10. extinct	ex-tinct'
11. gene	gene

12. fossil	fos'-sil
13. paleontology	pa-le-on-tol'-o-gy
14. Paleozoic	Pa-le-o-zo'-ic
15. Mesozoic	Mes-o-zo'-ic
16. Cenozoic	Ce-no-zo'-ic
17. Cambrian	Cam'-bri-an
18. Paleocene	Pa'-le-o-cene
19. Pliocene	Pli'-o-cene
20. Pleistocene	Pleis'-to-cene
21. Holocene	Hol'-o-cene